WE CLAIM:

An interconnect structure, comprising:

a plurality of interconnected nodes, including distinct nodes A and E;

the node A having a plurality of data input ports, a plurality of data output ports, and a control signal input port; and

the node E having a plurality of data input ports, a plurality of data output ports, and a control signal output port; and

a routing logic associated with the nodes, the routing logic for routing data selectively among the interconnected nodes;

the nodes A and E being positioned in the interconnect structure so that node A cannot route data to the node E, the node E cannot route data to the node A, and no node exists in the interconnect structure that can have data routed to it from both the node A and the node E; and

a logic included as part of said routing logic and associated with the node A that uses information concerning routing of data through the node E to route data through the node A.

2. An interconnect structure in accordance with Claim 1 wherein:

the plurality of interconnected nodes includes a node F distinct from the nodes A and E, the node F having a plurality of data input ports, a plurality of data output ports, and a control signal output port; and

the nodes A and F are positioned in the interconnect structure so that the node A cannot route data to the node F, the node F cannot route data through the node A, and no node exists in the interconnect structure that can receive data routed both from the node A and the node F; and

the logic associated with the node A uses information concerning routing of data through the node F to route data through the node A.

3. An interconnect structure in accordance with Claim 2 wherein:

the plurality of interconnected nodes includes a node B distinct from the nodes A, E and F, the node B having a plurality of data input ports, a plurality of data output ports, and a control signal output port; and

a logic associated with node B included as part of the routing logic being capable of sending a control signal z to the node A, the control signal z containing information concerning routing possibilities through the nodes B, F and E, and the logic associated with the node A for routing of data through the node A depending at least in part on information concerning routing of data through the nodes B, F and E.

4. An interconnect structure in accordance with Claim 3 wherein:

the plurality of interconnected nodes including a node C distinct from the nodes A, B, E, and F, the node C having a plurality of data input ports, and a plurality of data output ports;

the node B sends a message to the node C;

the node E sends a control signal y to the node B;

the node F sends a control signal x to the node B;

the logic associated with the node B sends a non-blocking control signal z to the node A based on the control signals x and y;

the node A sends a message to the node C; and

the node C simultaneously receives messages into all of its input ports.

5. An interconnect structure comprising:

a plurality of nodes including distinct nodes A, B and C, the nodes A and B being both positioned to send data to the node C;

a plurality of interconnect lines selectively coupling the nodes of the interconnect structure;

a control signal carrying line CBA connected from the node B to the node A for carrying control signals from the node B to the node A; and

a routing logic associated with the node B capable of sending data to the node C and sending a control signal z to the node A that can inform the node A that the node A is allowed to send a message to the node C.

6. An interconnect structure in accordance with Claim 5 wherein:

the node C has a plurality of N input ports; and

data from the nodes A and B arrive at the node C concurrently so that all N of the input ports of the node C receive messages simultaneously.

7. An interconnect structure in accordance with Claim 6 wherein:

the plurality of nodes includes distinct nodes A, B, C, D, E, F and H; and

the node C is capable of simultaneously sending data from the node A to the node D, and capable of sending data form the node B to the node H.

8. An interconnect structure in accordance with Claim 7 wherein:

the interconnect structure is hierarchical;

the node A is on a level of the hierarchy;

the nodes B, C, and D are on the level of the hierarchy directly below the level of the node A; and

the nodes E, F and H are on a level of the hierarchy directly below the level of the node B.

9. An interconnect structure comprising:

a plurality of nodes including the distinct nodes A, B and C, and a collection of interconnect lines selectively coupling the nodes;

the node C having a plurality of message input ports, the nodes A and C positioned in the structure so that A can route a data packet to C;

the nodes B and C positioned in the structure so that B can route a data packet to C;

the nodes A and B positioned in the network so that B can send a control signal to A;

the logic at the node A using the control signal B to route messages;

the node B routing a message MB to C;

the node A routing a message MA to C to arrive at concurrently with MG;

all input ports of C concurrently receiving a message.

10. An interconnect structure comprising:

a plurality of interconnected nodes including a node C having input ports I_A and I_B and output ports O_H and O_D;

a plurality of interconnected structure output ports that are accessible from input port I_B but not from output port O_H; and

a routing logic included within the interconnect structure to assure that when a message M_A arrives at input port I_A, and simultaneously a message M_B arrives at input port I_B there

is a path through output port O_D to a target destination for message M_A and a path through output port O_H to a target destination for message M_B.

11. An interconnect structure in accordance with claim 10, wherein said routing logic assumes that message M_B is not blocked from using output port O_H and message M_A is not blocked from using output port O_D.

12. An interconnect structure in accordance with claim 11, wherein said routing logic for the routing of messages M_A and M_B depends in part on QOS criteria.

13. An interconnect structure comprising:

a plurality of interconnected nodes including nodes A, B, C, D, and H, each of the nodes A, B, C, D and H having a plurality of input ports and a plurality of output ports, and node C being positioned to receive messages from A and B and to route messages to D and H;

a plurality of interconnect structure output ports including the output port P so that P is accessible from node C but not node H;

a routing logic included within the interconnect structure to assure that when node A sends a message MA to node C and concurrently node B sends a message MB to node C, then node C can route MA through node D to a target interconnect structure output port for MA and node C can route MB through node H to a target interconnect structure output port for MB.

14. An interconnect structure in accordance with claim 13, wherein said routing logic assures that message M_B is not blocked from node H, and message M_A is not blocked from node D.

15. An interconnect structure in accordance with claim 14, wherein said routing logic is responsive to QOS criteria.